

Spacecraft Cabin Air CO₂ Recovery, Phase I

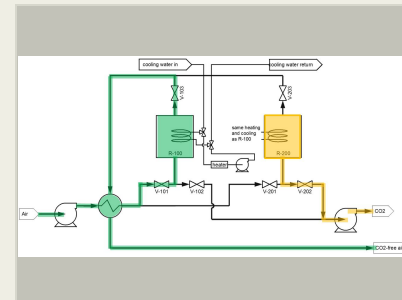
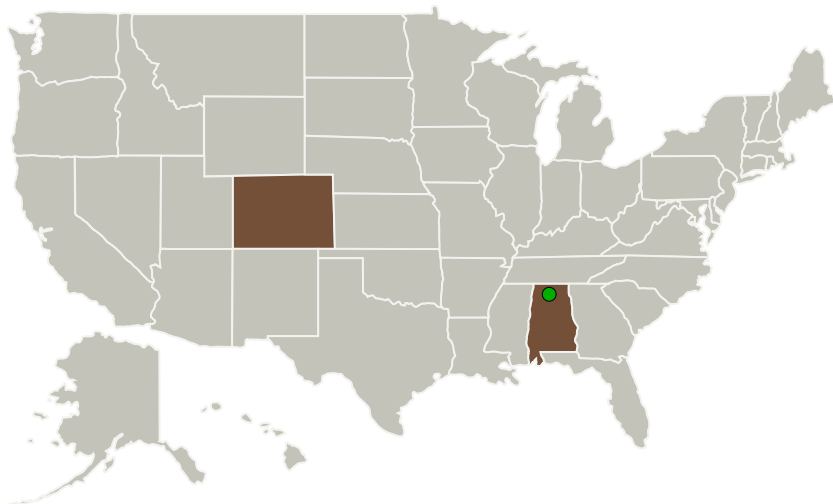
Completed Technology Project (2017 - 2017)



Project Introduction

An advanced Environmental Control and Life Support System (ECLSS) for long duration manned space missions such as planetary flight missions or planetary bases- requires an almost complete closure of all relevant material loops. Energy efficient carbon dioxide (CO₂) removal and reduction systems are critical to reducing the power consumption of the spacecraft atmosphere revitalization systems. TDA proposes to develop a rapidly cycling vacuum-assisted thermal swing adsorption (VTSA) system to remove CO₂ from cabin air and concentrate it for subsequent reduction and pressurization. Our unique sorbent exhibits one of the highest capacities reported for CO₂ adsorption at very low CO₂ partial pressures (1-3 torr CO₂ partial pressure range). The low heat of adsorption of CO₂ on the sorbent and the relatively low heat input needed to desorb the CO₂ across a small temperature differential during regeneration will reduce the power requirement for the process. The new material is also highly tolerant to moisture. In Phase I, we will prepare the sorbent and demonstrate its ability in selectively removing CO₂ from air under representative conditions. The technology readiness level (TRL) will be elevated to 3 at the end of Phase I. We will also complete the detailed design of the VTSA reactor. In Phase II, we will build a high fidelity prototype assembly and demonstrate the concept at full-scale, elevating the TRL to 5.

Primary U.S. Work Locations and Key Partners



Spacecraft Cabin Air CO₂ Recovery, Phase I Briefing Chart Image

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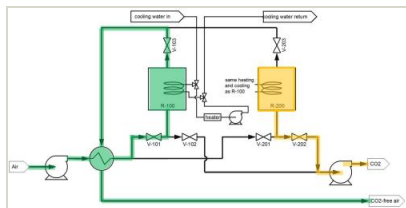
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Organizations Performing Work	Role	Type	Location
TDA Research, Inc.	Lead Organization	Industry	Wheat Ridge, Colorado
● Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	Colorado

Images



Briefing Chart Image

Spacecraft Cabin Air CO2 Recovery,
Phase I Briefing Chart Image
(<https://techport.nasa.gov/image/135386>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

TDA Research, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

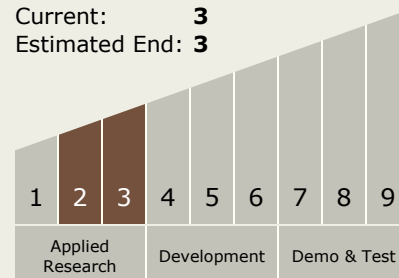
Carlos Torrez

Principal Investigator:

Gokhan Alptekin

Technology Maturity (TRL)

Start: 2
Current: 3
Estimated End: 3



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Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
 - └ TX06.1 Environmental Control & Life Support Systems (ECLSS) and Habitation Systems
 - └ TX06.1.1 Atmosphere Revitalization

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System